



DEPARTMENT OF NATURAL RESOURCES  
WATER PROTECTION PROGRAM  
WATER QUALITY MONITORING AND ASSESSMENT SECTION  
WATERSHED INFORMATION SHEET

## Little Chariton River Basin-10280203

### Basin Description

The Little Chariton River originates a few miles south of Kirksville and flows almost due south through north central Missouri to its confluence with the Missouri River at Glasgow. Nine miles above the mouth, the river divides into the Middle and East forks. The largest tributary to the Middle Fork is Stinking Creek and the largest tributaries to the East Fork include Silver and Sweet Springs creeks and Long Branch. The largest reservoirs in the basin are Long Branch Reservoir (2,430 acres) and Thomas Hill Reservoir (4,400 acres).

Average annual rainfall is 39 inches. Streamflow statistics for the Little Chariton River basin are shown in Table 1.

Table 1. Streamflow Statistics for L. Chariton River Basin

| Stream/Location                     | Water shed Area (sq.mi) | Period Of Record | Flow (cfs)                    |      |           |                                 |                |
|-------------------------------------|-------------------------|------------------|-------------------------------|------|-----------|---------------------------------|----------------|
|                                     |                         |                  | 90 <sup>th</sup> Percentile * | Mean | Median ** | 10 <sup>th</sup> Percentile *** | 7Q10 Low Flow+ |
| Long Branch at Atlanta              | 23                      | 1995-2004        | 21                            | 19.2 | 0.72      | .02                             |                |
| E. Fk. L. Chariton R. nr Macon      | 112                     | 1971-2004        | 272                           | 88.3 | 42        | 6.8                             |                |
| E. Fk. L. Chariton R. nr Huntsville | 220                     | 1962-2004        | 380                           | 174  | 59        | 9                               | 0.0            |

\* Flow is less than this amount 90 percent of the time

\*\*Flow is less than this amount 50 percent of the time

\*\*\*Flow is less than this amount 10 percent of the time

+ The lowest average 7 consecutive day flow that occurs with a recurrence interval of 10 years.

The Little Chariton River basin lies with the Dissected Till Plains physiographic province. The land is a mixture of hills and plains with the northern portion of the basin having more hills and woods than any other portion of the plains region in Missouri. Forty-seven percent of the land is pasture and hayfields, 30 percent is cropland, 19 percent forest, 3 percent water and wetlands and 1 percent urban.

Except for limited areas where streams may have incised Pennsylvanian aged rock, the surface of the basin is glacial till overlain by loess. Glacial till is a mostly unsorted mixture of clay, sand, gravel and rock debris created and pushed southward into Missouri by the great glacial ice sheets. Loess is windblown silt deposits. Depth of the till is highly variable but is generally less than 200 feet. Loess deposits are generally 4-8 feet in depth. Cyclical (repetitive) deposits of sandstone, siltstone, shale, limestone and coal of Pennsylvanian age underlie these glacial deposits.

The presence of the clayey till and the underlying shale and coal beds insure that there is very little movement of water to the subsurface. Most water movement in the basin is through the surface stream network. Water that reaches the subsurface will resurface locally when a stream valley incises a confining aquatard (an impermeable layer). There are no known springs within the basin. Since very little water infiltrates to the subsurface, streamflows can be very high during wet weather. For the same reason, base flows, streamflow sustained only by the re-emergence of groundwater into the stream, are very low during the intervening dry periods.

## **Water Quality Concerns**

Acceptable water quality is defined by Missouri's Water Quality Standards [<http://www.sos.mo.gov/adrules/csr/current/10csr/10c20-7a.pdf>] . Streams or lakes that do not meet these standards are judged to be "impaired". They may not be fit for certain uses such as swimming, drinking water supply or protection of fish and other aquatic life. Waters are judged to be "affected" if water quality changes are less serious and state standards are not exceeded. These standards also list more than 3,600 classified streams and more than 400 classified lakes in the state. A classified stream is one that is either a permanently flowing stream or one that may stop flowing in dry weather but still maintains large pools of water that support aquatic life. Unclassified streams are small tributaries to classified streams. They typically have flowing water only during wet weather, and are dry for the remainder of the year.

### **Water Quality in Prairie Streams**

<http://www.dnr.mo.gov/env/wpp/watersheds/info/wq-prairie-str.pdf>

### **Aquatic Habitat in Prairie Streams**

<http://www.dnr.mo.gov/env/wpp/watersheds/info/aquatic-hab-prairie-str.pdf>

## **Point Source Pollution**

Point source pollution is a discharge of wastewater from a single location such as a wastewater treatment plant. Wastewater treatment plants can serve industries, small businesses, subdivisions, mobile home parks, apartment complexes, or entire cities. Wastewater from residential sources such as subdivisions, apartments and mobile home parks is often referred to as "domestic wastewater." It primarily contains treated human wastes, food wastes and detergents. The primary pollutants of concern in domestic wastewater are the amount of organic matter, which is commonly reported as Biological Oxygen Demand (BOD), suspended solids, and ammonia. Industrial and commercial wastewater can be more complex and may contain, in addition to domestic wastes, heavy metals or man-made organic chemicals that can be potentially toxic. Discharges from most municipal wastewater treatment plants usually are a mixture of domestic and industrial/commercial wastewater. Most wastewater plant discharges are also typically

high in nitrogen and phosphorus, two elements that act as fertilizers and can cause excessive algae growth in waters receiving these discharges.

There are 18 permitted domestic or industrial/commercial wastewater point sources that discharge a combined 7.3 million gallons per day (mgd) into the waters of the Little Chariton River basin. Most of this wastewater flow is from the 6.7 mgd discharge from the AECI Thomas Hill power plant ashpond. There are 249 miles of classified streams in the basin, of which two miles (one percent) are known to be affected or impaired by these point source discharges. Point source discharges are also known to affect or impair 1.2 miles of unclassified streams in the basin. The Atlanta municipal discharge is the only one known to affect or impair more than 0.5 miles of stream.

#### Wastewater Treatment

<http://www.dnr.mo.gov/env/wpp/watersheds/info/wastewater-treatment.pdf>

### Nonpoint Source Pollution

Nonpoint source pollution occurs when pollutants enter bodies of water at points that are not well-defined and stable. Examples include the erosion of sediments or the entrance of polluted surface runoff or groundwater into lakes and streams. Locations of nonpoint source pollution are often widely dispersed and are difficult to identify or control. In the Chariton River basin, the most serious nonpoint problem is degradation of aquatic habitat. A total of 249 miles (100 percent) of classified streams in the basin are considered to have degraded aquatic habitat. The lack of infiltration of rainfall, when combined with local soil tillage and other land uses, leads to a large amount of surface runoff during wet weather. This contributes to soil erosion and high levels of sediment deposition in streams. The quality of aquatic habitat is further impaired by removal of wooded riparian vegetation, and by the channelization, or straightening, of streams. Channelization has occurred in 33 miles (13 percent) of streams in the basin.

Storm water runoff in the Midwest can carry significant amounts of fertilizers, animal wastes, and pesticides into streams. Atrazine is an agricultural herbicide used on corn and grain sorghum that is commonly found in stormwater. Missouri's water quality standards allow no more than 3.0 ug/l Atrazine in drinking water reservoirs as a long-term average. There are three reservoirs in the Little Chariton River basin that serve as drinking water supplies. None of these reservoirs have average Atrazine levels in excess of state standards. Average Atrazine levels for these reservoirs are given in Table 2. Drinking water reservoirs throughout northern and western Missouri are also monitored for several other common agricultural herbicides. Results of this monitoring over many years indicates that the only other herbicide that may be a human health concern in drinking water reservoirs is Cyanazine. None of the drinking water reservoirs in this basin exceed health advisory levels for Cyanazine. Federal regulations require the end of all Cyanazine use in 2002.

Table 2. Long Term Average Atrazine Levels in Drinking Water Reservoirs in the Little Chariton River basin.

| Reservoir             | Water Supply     | Average Atrazine in the Reservoir (ug/l) |
|-----------------------|------------------|--|
| Sugar Creek Lake      | Moberly          | 1.85                                     |
| Long Branch Reservoir | Macon            | 1.46                                     |
| Thomas Hill Reservoir | AECI T.Hill No.3 | 0.97                                     |

Levels of Atrazine in finished drinking water supplies may be significantly lower than the amounts found in the reservoirs if the drinking water plants take measures to reduce Atrazine during the water treatment process.

Groundwater can also be affected by nonpoint source pollution. In northern and western Missouri, some public water supplies and many private water supplies come from groundwater. While public groundwater supplies are routinely tested and protected, many private wells are not. Studies of water quality of private wells in northern and western Missouri show that about one third of wells exceed the drinking water standard for nitrate. And about two percent exceed drinking water standards for pesticides. This contamination is often caused by local land use practices or surface contamination of the wellhead and does not represent widespread contamination of the underground aquifer. Deeper aquifers are protected from surface contamination by impermeable strata. During warm weather when stream flows are low, livestock tend to gather in and around streams. The wastes they leave in the water contribute to nuisance algae growths, low levels of dissolved oxygen and elevated levels of ammonia and bacteria.

There has been both surface and underground coal mining in portions of the basin in the northern half of Randolph County and southern Macon County. As a result, 4.5 miles of Little Chariton River north of Huntsville, two and one half miles of North Claybank Creek and tribs south of Keota, and ten miles of Dark Creek are affected or impaired by elevated levels of sulfate. Of more concern are the four and a half miles of Sugar Creek and its tributaries are affected or impaired by acidity and or elevated sulfate levels due primarily to mining in the immediate vicinity of Huntsville. A comparison of mean water quality in three of these streams is made to the nearby Chariton River that is not affected by drainage from coal mined lands.

Table 3. Mean Water Quality in Four Streams in Randolph and Chariton Counties

| Stream                                | Dates   | pH    | Sulfate (mg/L) | Chloride (mg/L) |
|---------------------------------------|---------|-------|----------------|-----------------|
| Dark Creek nr Huntsville              | 2000-04 | 7.6   | 813            | 16              |
| E. Fk. Chariton nr Huntsville         | 1999-03 | 7.7   | 274            | 7               |
| Sugar Creek nr Huntsville             | 2000-04 | 6.4   | 573            | 14              |
| Chariton R. nr Prairie Hill (control) | 1999-03 | 8.0   | 44             | 8               |
| Water Quality Standard                |         | 6.5-9 | 1000*          | 230             |

## **Water Quality Management**

The department achieves water quality management of point source pollutants through the issuance and enforcement of wastewater discharge permits. These permits limit the amount of pollutants that can be discharged. All point source wastewater dischargers must obtain a permit and adhere to its discharge limitations. All permits require at least a level of treatment equal to national wastewater treatment standards. In situations where these national treatment standards are not adequate to protect the streams or lakes receiving these wastewater discharges, stricter permit limits that do protect these waters are required. The permits require regular monitoring and reporting of discharge quality. The department also conducts regular inspection of wastewater treatment facilities and receiving waters.

Nonpoint source pollution is addressed through the state's nonpoint source management plan. This plan is a cooperative program between the Department of Natural Resources and other federal, state and local government agencies or organizations, local landowners and other interested citizens. The plan emphasizes addressing problems at the watershed level through the use of management practices that control nonpoint pollution. The most commonly supported practices are those that control soil erosion on agricultural and urban lands, improve quality and quantity of forage on grazing lands, protect riparian zones, and those that control runoff of animal manures, fertilizers and pesticides. The state nonpoint source management plan is a voluntary program that provides funds to help defray the cost of adopting management practices. Federal Section 319 grants administered by the department for control of nonpoint pollution sources have been used to fund an assessment of treatability of acid mine drainage in the Huntsville area.

The Missouri Department of Natural Resources monitors water chemistry and aquatic invertebrate communities at many locations in Missouri. The department also tracks the quality of domestic, industrial and storm water discharges. These monitoring activities provide information on water quality problems, such as their specific location, pollutants, sources and possible solutions. This information guides the management activities the department takes to protect water quality in Missouri.

## **Web links**

US Geological Survey  
<http://mo.water.usgs.gov/>

Kansas City District Corps of Engineers

<http://www.nwk.usace.army.mil/>

Missouri Department of Conservation

<http://www.mdc.mo.gov/fish/watershed/chariton/060cotxt.htm>

US Environmental Protection Agency

<http://www.epa.gov/region7/water/index.htm>